GROUND FAULT INTERRUPTER DEVICES

Application Information

OVERVIEW

Easy Heat offers a wide range of high quality electric heat tracing products and accessories. Electric heat tracing systems are an economical, convenient and effective solution to many cold weather related problems, such as pipe freeze-up, snow melting, roof-deicing, cold floors, etc. Always follow installation instructions provided with the product.

As with all electrical products, damaged or improperly installed heat tracing products can produce shock and/or fire hazards. For this reason, the US National Electrical Code, and many electrical codes of other countries, require that ground fault interrupter devices be included in most electrical heat tracing installations. Contact your local electrical code authority for all regulations related to your project.

DEFINITIONS

***Branch Circuit*—**The conductors between the final overcurrent device protecting the circuit and the electrical outlet(s) or utilization equipment.

***Current*—**The amount of electricity flowing through a conductor. Similar to the volume of water flowing through a pipe. Usually measured in Amps or milli-amps (1/1000 of an Amp).

***Ground*—**The basic reference point for the measurement of voltage in an electric circuit. The voltage at a grounded point of an electric circuit will always be zero. The ground point of the electricity supply to most electric circuits is earth.

***Ground Fault*—**Current misdirected (or "leaking") to ground from the intended conductive path (circuit). This is typically measured by comparing the current going out to the circuit with the current returning from the circuit; the difference, which is usually quite small, is the current leaking to ground. Usually measured in milliamps.

***GFI Device*—**"Ground Fault Interrupter" Device. Monitors and disconnects power to a circuit in the event of a serious ground fault. Such devices can have trip levels from 5 to about 300 milliamps of ground fault current.

***GFEP Device*—**"Ground Fault Equipment Protection" Device. Specific type of GFI designed for the protection of equipment from damage that can be caused by current leaking through the equipment. Generally, a GFEP device prevents fires. This device opens all ungrounded conductors supplying the equipment. The most common, and generally least expensive, have a 30 milliamp trip setting.

***GFCI Device*—**"Ground Fault Circuit Interruption" Device. Specific type of GFI designed to protect people from shock, and which trips when ground faults greater than 5 milliamps are detected. When used with heat tracing systems, GFCI devices can result in nuisance tripping due to the 5 milliamp trip point setting, especially if the heat tracing cable is longer than about 200 ft.

***Nuisance Tripping*—**The tripping of a GFI when no real fault exists in the circuit. This can occur due to electrical "noise" or spikes in a circuit, such as when large electric motors are started or stopped. GFIs, especially those with lower trip levels, will sometimes sense these spikes and trip. Since no fault actually exists in the circuit, the trip is considered a "nuisance."

***Voltage*—**The potential for electric current to flow through a conductive path. Similar to the pressure of water in a pipe. Usually measured in Volts.

EASYHEAT®
US T. (800) 537-4732 / F. (888) 324-2440
CAN T. (800) 794-3766 / F. (800) 361-4574

DANGERS OF GROUND FAULTS

Ground faults occur as a result of the voltage in a circuit coming in contact with a person or an object connected to ground. This could happen when a heating cable is improperly installed, e.g; using a metal pipe clamp to secure a heating cable. The clamp could force the heating cable ground braid through the heating cable jacket/insulation and into contact with voltage in the heating cable. This would then allow current to flow through the braid, and even the pipe clamp/pipe, to ground, resulting in excessive current flowing through the heating cable. Depending on the circuit breaker size, usually at least 15 amps (which is 15,000 milliamps), the location of the fault and the quality of the connection to ground, it is possible that the circuit breaker will not trip as a result of this fault. Left unchecked, the heating cable could overheat creating a risk for fire or electrical shock. By having a GFI device installed in the circuit, when the ground fault current exceeds the device trip, the faulty circuit will be isolated from its power supply, thereby protecting the associated equipment (machines, building, etc.) from damage. As can be seen, the protection provided by a typical 30 milliamp GFI device far exceeds that of a 15,000 milliamp circuit breaker, which is usually the smallest size possible.

Similarly, when a person comes in contact with the voltage in a circuit, current flows through the person to ground. However, the amount of current which will flow through the person is highly dependant on the conductivity of the connection of the person to ground. The conductivity of this connection can vary dramatically from day to day, from building to building, from person to person. Certainly the presence of water always improves the connection, making the contact with voltage potentially more dangerous. Current greater than about 7 milliamps flowing through a human body can result in permanent damage or even death. For this reason, GFCI devices, which trip when leakage current exceeds 5 milliamps, are designed to directly protect humans from shock hazards. Note: The GFCI does not eliminate the danger of shock. A person becoming part of the normal conductive path (which could occur by simultaneously touching both the “hot” and “neutral” conductors) may not cause a GFCI to trip – whether or not the GFCI will trip depends on how well the person is connected to ground. If the GFCI does not trip, the person can experience severe electrical shock resulting in injury or death. By extension, of course, GFCI devices also provide equipment (fire) protection. While GFIs with trip levels greater than 5 milliamps do not provide direct shock protection for people, these devices do provide indirect shock protection by disconnecting power from most faulty circuits before any contact by persons can occur.

GROUND FAULT PROTECTION OPTIONS FOR HEATER CABLES

Every wire has a certain amount of natural leakage. Since heating cables are generally very long, the “natural” leakage current can be several milliamps. To avoid nuisance tripping it is important to select the proper type of GFI device for use with heating cables.

There are numerous products on the market to provide ground fault protection. Sometimes controls for electrical systems will have integral GFEP. Most often, though, the best ground fault protection will depend on your application and the decision is left to the system designer/installer.

GFCI is a specific type of GFI designed to reduce the risk of direct electrical shock. GFCI devices are usually installed in duplex receptacles in bathrooms and outdoors, although GFCI branch circuit breakers are also common. GFCIs may be acceptable for small heat tracing applications, but the 5 milliamp trip setting often causes nuisance trips in larger installations. For this reason, GFCI products are usually not appropriate for larger installations.

Larger projects require higher voltages or currents. A branch circuit breaker with GFEP protection is most likely the best solution. The appropriate breaker for your application depends on the equipment voltage rating, expected load current, and manufacturer type of loadcenter or panelboard in which the breaker is to be installed. The following GFEP Circuit Breaker Tables may assist in your selection. The tables are not an endorsement for any particular brand of product, nor do they imply merchantability or fitness for any particular purpose. They are intended only to give an indication of the products available. Consult the manufacturer’s information for product suitability for your project.

Industrial applications can involve voltage or current ranges for which no GFEP circuit breakers are available. Zero sequence ground fault sensors, supplied by numerous manufacturers, used in conjunction with a shunt trip breaker can provide proper ground fault protection for virtually any heat tracing application. Contact EASYHEAT for more information on this type of ground fault protection system.

Unit Mount Style GFEP Branch Circuit Breakers

Unit Mount Style	Eaton Cutler-Hammer	K-Tec
277V, 1-Pole	C Series	
15 amp	GHCGFEP1015	
20 amp	GHCGFEP1020	
25 amp		
30 amp	GHCGFEP1030	
40 amp	GHCGFEP1040	
50 amp	GHCGFEP1050	
60 amp	GHCGFEP1060	
277V, 1-Pole		
25 amp		*GFCB4225
40 amp		*GFCB4240
60 amp		*GFCB4260

Bolt-On Style GFEP Branch Circuit Breakers

Bolt-On Style	Square D	Eaton Cutler-Hammer		GE	Siemens
120V, 1-Pole		**Quicklag (WestingHouse)**	**C Series**		
15 amp	QOB115#PD	QBGFEP1015		THQB1115GFEP	BE115
20 amp	QOB120EPD	QBGFEP1020		THQB1120GFEP	BE120
25 amp	QOB125EPD	QBGFEP1025			
30 amp	QOB130EPD	QBGFEP1030		THQB1130GFEP	BE130
120/(208)240V, 2-pole*					
15 amp	QOB215EPD	QBGFEP2015		THQB2115GFEP	BE215
20 amp	QOB220EPD	QBGFEP2020		THQB2120GFEP	BE220
25 amp	QOB225EPD	QBGFEP2025			
30 amp	QOB230EPD	QBGFEP2030		THQB2130GFEP	BE230
277V, 1-pole					
10 amp		GFXBB110B2			
15 amp	EHB14015EPD**	GFXBB115B2	GHBGFEP1015		
20 amp	EHB14020EPD**	GFXBB120B2	GHBGFEP1020		
25 amp	EHB14025EPD**	GFXBB125B2			
30 amp	EHB14030EPD**	GFXBB130B2	GHBGFEP1030		
40 amp	EHB14040EPD**	GFXBB1140B2	GHBGFEP1040		
50 amp	EHB14050EPD**		GHBGFEP1050		
50 amp			GHBGFEP1060		

* For use on 208V or 240V. WYE-Connected Distribution systems; not for use on Delta connected systems.
** Available only from Raychem Distributors under proprietary agreement.

Plug-In Style GFEP Branch Circuit Breakers

Plug-In Style	Square D	Eaton Cutler-Hammer		Siemens
120V, 1-Pole		**Quicklag (WestingHouse)**	**CH Series**	
15 amp	QOB115#PD	QPGFEP1015	CH115EPD	QE115
20 amp	QOB120EPD	QPGFEP1020	CH120EPD	QE120
25 amp	QOB125EPD	QPGFEP1025		
30 amp	QOB130EPD	QPGFEP1030	CH130EPD	QE130
120/(208)240V, 2-pole*				
15 amp	QOB215EPD	QPGFEP2015	CH215EPD	QE215
20 amp	QOB220EPD	QPGFEP2020	CH220EPD	QE220
25 amp	QOB225EPD	QPGFEP2025		
30 amp	QOB230EPD	QPGFEP2030	CH230EPD	QE230
40 amp		QPGFEP2040	CH240EPD	QE240
50 amp		QPGFEP2050	CH250EPD	QE250
60 amp			CH260EPD	QE260

* For use on 208V or 240V. WYE-Connected Distribution systems; not for use on Delta connected systems.